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EAST TEXAS FORESTS AND THE FUTURE

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U. S. DEPARTMENT OF AGRICULTURE
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The Occasional Papers of the Southern Forest Experiment Station present information on current southern forestry problems under investigation at the Station. In some cases, these contributions were first presented as addresses to a limited group of people, and as "occasional papers" they can reach a much wider audience. In other cases, they are summaries of investigations prepared especially to give a report of the progress made in a particular field of research. In any case, the statements herein contained should be considered subject to correction or modification as further data are obtained.

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Introduction

Although forest growth occurs on less than a fifth of the total land area of Texas, it represents one of the State's major natural resources. The commercial forests of Texas are confined to the eastern section of the State and the discussion here will deal primarily with that area.[2/] For many years, east Texas forests have provided material for building homes, communities, railroads, churches, and schools; they have given employment to thousands of workers; in addition, they have exerted a beneficial influence in conserving rainfall and in protecting soil from excessive erosion. Today these forests are providing materials essential to the war effort of America and her Allies. Under proper management, the forests of east Texas can provide the raw materials needed for all its present forest industries and also for many additional establishments, to the greater security and prosperity of all the people. Compared with many other sections of the country, east Texas offers advantages for the maintenance of forest industries, as its soil and climate favor rapid tree growth, there are many widely used hardwood and softwood tree species native to this section, markets are at hand, and labor is abundant.

Location and Availability

After many years of forest exploitation and clearing of forest land for farms, the commercial forests of east Texas still occupy almost 11 million acres, or about 57 percent of the land area. Actually, this exceeds by 3 million acres the total acreage of the State's principal farm crop, cotton. Forests are found in every section of east Texas with the exception of the tidal marshes along the Gulf of Mexico. Road, rail, and water transportation facilities are entirely adequate. Logging operations are relatively simple; as a result of the construction of highways and improvement in motorized equipment, transportation of logs and lumber by truck has become common and is rapidly increasing in importance.

Area, Type, and Volume

According to the recently completed forest survey conducted by the U. S. Forest Service, the productive forest area of Texas, by forest type and condition, was classified as follows (for 1935):

1/ Address before the Annual Meeting of the Texas Academy of Science, at College Station, Tex., Nov. 14, 1942.

2/ Although not discussed in this paper, Texas has several other forested areas, the chief value of which lies in protection of the soil resources, preventing erosion and controlling the run-off of rain water. The more important of these forested areas are the Post Oak belt which adjoins the east Texas commercial pine region on the west; the Cedar Brakes of central Texas; the East and West Cross Timbers, extending from the Cedar Brakes northward to the Oklahoma boundary; and scattered stands of mesquite, live oak, and other species in various localities.

Forest type	Forest condition				Percent
	Old growth	Second growth	Reproduction and clear-cut	Total	
	Thousand acres				
Longleaf	128	513	290	931	9
Shortleaf-loblolly	375	5,825	126	6,326	60
Upland hardwoods	259	1,051	112	1,422	13
Bottom-land hardwoods ..	698	1,138	38	1,874	18
Total	1,460	8,527	566	10,553	100
Percent	14	81	5	100	

The total merchantable wood volume in Texas, classed either as saw timber or cordwood, on January 1, 1939, was as follows:

Tree species group	Saw timber1/	Cordwood2/
	Million feet b.m. (lumber tally)	Thousand cords
Pine	19,290	73,189
Hardwood (including cypress)	10,336	55,084
Total	29,626	128,273

1/ Pine 9 inches and larger, and hardwoods 13 inches and larger, in diameter, at breast height.

2/ All trees 5 inches in diameter and larger, at breast height, whether saw-timber size or under; excludes culls and hardwood tops and limbs.

These forests today are characterized by second-growth timber, much of it below the minimum size for most industrial uses. While these young forests do not have the high quality of the original old-growth stands, they are of sufficiently good quality to supply most market needs.

Current Forest Situation

What is the present situation as regards this valuable Texas resource? Although commendable progress has been made in the adoption of good forestry practices by a growing number of progressive timberland owners in East Texas, the forests as a whole are far from being in a sound condition. A recent survey by the U. S. Forest Service indicated that East Texas forests are in general understocked, producing at less than half of their potential capacity. Part of this is due to destructive timber cutting practices of the past, although even today altogether too much timber is being cut without any conscious attempt to perpetuate the forest. This is especially true of the operations of hundreds of small portable mills, the owners of which usually possess no timberland, and who generally cut any tree that will make a 2x4.

In southeast Texas there are many thousands of acres of land formerly covered by some of the finest longleaf pine in the South that now are desolate and bare stump fields; they will not bear another timber crop unless planted. Part of the present unsatisfactory forest condition also can be laid to oft-recurring fires, which in the past have destroyed untold millions of forest seedlings and reduced the growth and the quality of the remaining trees.

Adequate protection of forests from fire is one of the essentials of good forest management, yet today a considerable portion of the east Texas forest area is not under organized fire protection. With fire protection and good forest management east Texas can be assured of a maximum of forest products, expanded industries, more jobs for labor, additional revenues, and improved social conditions for its people.

Ownership or Control

According to recent estimates, about two-thirds of the forest land in east Texas is in small holdings (under 3,000 acres) mostly owned by farmers. Approximately 6 percent of the forest area is in national forests and 6,400 acres, or 6 hundredths of 1 percent, is in State forests. An undetermined area is in public ownership as a result of tax delinquency. The balance is in the hands of lumber companies, pulp and paper mills, oil companies, and in other large holdings.

Value of Forest Products

The cost or value of individual forest products varies greatly with many factors. The Census for 1939 showed that the materials produced by the primary forest-products industries in east Texas during that year were valued at more than 50 million dollars, as follows:

Forest-products industry	Value of products
	Thousands of dollars
Sawmills, veneer plants, etc. ..	27,925
Logging camps	970
Planing mills	9,314
Pulp mills	1,432
Paper mills	3,616
Paper bags	1,276
Paperboard containers	2,753
Cooperage	249
Wood preserving	8,088
Total	55,623

General Uses of Forest Products

The most important industries depending upon east Texas forests for their raw materials are those manufacturing lumber and paper, and wood preserving plants. Other important forest products include fuel wood, veneer, cooperage, poles and piling, fence posts, and railroad cross ties. The forests also support an important range livestock industry, provide a home for game animals, and afford opportunities for hunting and other recreational activities. Considerable cut-over timberland is leased for oil development. These multiple uses of forest land provide additional income while the timber crop is growing.

Texas has 2 pulp mills, 1 of which is the only one of its kind, a newsprint mill which manufactures newsprint from southern pine. The forests of east Texas support industries employing more than 21,000 laborers. According to the 1939 Census, about 15 percent of all workers employed in the State's manufacturing industries received their income directly from the preparation of forest products for the market. The wages and salaries paid by these

forest-products industries in 1939 totaled over 16 million dollars. Most of the forest industrial plants are located in small towns and in rural areas. Lumber manufacture alone accounted for most of the forest industry employment.

The number of primary forest industrial plants in east Texas, according to the most recent information available, is as follows:

Sawmills cutting 25 million bd.ft. or more annually	7
" " 15-25 " " " " "	15
" " 10-15 " " " " "	19
" " 5-10 " " " " "	28
" " 1- 5 " " " " "	179
" " under 1 " " " " "	300
Treating plants (for poles, piles, cross ties, etc.)	10
Veneer plants	26
Stave and heading plants (cooperage stock	5
Pulp mills (using only wood)	2
Small dimension plants	6
Miscellaneous wood-using plants	63

Production Trends

According to the U. S. Forest Service, the commodity usage of Texas forest products during recent years was as follows:

Commodity	Year			
	1935	1936	1937	1938
	-----Thousands of cords 1/------			
Lumber	1,971	2,584	2,674	2,481
Cross ties	263	343	383	223
Poles and piles	37	63	68	47
Veneer	62	66	77	84
Cooperage	21	17	18	15
Pulpwood	-	12	111	109
Miscellaneous	18	16	12	11
Fuel wood	899	861	934	934
Fence posts	58	49	54	54
Miscellaneous farm use	21	22	23	23
Land clearing	224	167	187	187
Total	3,574	4,200	4,541	4,168

1/ From all trees 5 inches d.b.h. and larger, and including bark.

Exports and Imports of Lumber

Recent trends of lumber exports and imports for Texas are as follows:

Item	1936	1938	1940
	Billion feet, board measure		
Lumber production 1/	.94	1.03	1.27
Lumber imports	.41	.38	.43
Total lumber distributed	1.35	1.41	1.70
Lumber used in Texas	.99	1.10	1.40
Lumber shipped out of the State	.36	.31	.30

1/ Lumber production in Texas for other recent years, in billions of feet b.m., is as follows: 1937, 1.13; 1939, 1.14; 1941, 1.33.

These figures indicate that Texas is more of a lumber importing than an exporting State. Per capita consumption of lumber in Texas in recent years was 168 bd.ft. in 1936, 180 bd.ft. in 1938, and 228 bd.ft. in 1940, very near the national average for each of these years.

Specific Uses and Byproducts

In the past, Texas has produced large quantities of lumber and other roughly manufactured wood products for its own uses, such as for building construction, and for shipment out of the State. The principal secondary wood-using industries in Texas as reported for 1940, listed on the basis of the amounts of wood used, were as follows:

Products	Wood used
	Million feet, b.m.
Boxes, baskets, crating	80.7
Sash, doors, general millwork	62.6
Furniture	15.5
Flooring	12.9
Car construction and repair	11.3
Caskets and burial boxes	6.3
Handles	5.2
All others	12.0
Total	206.5

The principal species of woods used by these secondary wood-using industries were as follows:

	Volume used, million feet b.m.
Pine, southern yellow	52.5
Pine, ponderosa	40.5
Tupelo and black gum	32.5
Gum, red	26.4
Oak	15.9
Cottonwood	14.8
Cypress	6.0
All others (using less than 5 million feet each)	17.8
Total	206.5

To take full advantage of the opportunities offered by its forests, to absorb more of its local labor, and to permit realization locally of the values of further processing, east Texas is greatly in need of additional remanufacturing plants, such as furniture factories, wood fabricating industries, plywood and plastic plants, etc., which will produce finished goods for local and national consumer markets. The recent expansion of the pulp and paper industry is an excellent example of progress in this direction.

Useful as wood is in the form in which nature provides it, science has shown the way to transformations that add greatly to its importance as a resource of our developing civilization. Although wood conversion products as yet rate far below lumber and other primary products in bulk of wood consumed, they satisfy many needs and promise to become increasingly important. A few of

the products of east Texas forests which can be utilized advantageously by manufacturing industries will be discussed in the next few paragraphs. Many of these products serve war needs and are of great importance now.

Pulp and Paper

Cellulose is the most important part of wood from the chemical-industrial standpoint. This remarkable substance is nature's framework and construction material with which are formed the walls of cells that make up the bodies of all plant life. Wood is the most abundant and compact source of this material, more than half of its substance being cellulose fiber. Wood is the principal source of many kinds of paper and pulp products, so essential to our everyday life and to the war effort. Cellulose made from wood is relatively cheap, worth currently about 4 cents per pound, far below the price of cotton, which has formerly been the principal source of pure cellulose.

With paper consumption rapidly increasing in this country and with imports of European pulp and paper shut off because of the war (before 1939, the United States imported more than half of its annual pulp and paper requirements), there may be further opportunities for growth of this industry in east Texas. This should be guided, however, by careful consideration of the quantity, quality, and availability of pulpwood, the effect on the raw material supplies required by other forest-products industries, and with due regard to factors of long-time investment. It is also contingent upon the maintenance of east Texas' marked advantages over other sections of the United States and foreign sources in regard to costs of pulpwood and other raw materials, and of the manufacturing operations.

The 2 Texas pulp mills (at Houston and Lufkin) use southern pine, the one at Houston operating by the sulphate process, where the bulk of the pulp is bleached and made into fine white papers. The pulp mill at Lufkin produces newsprint, the only plant of its kind in the entire South.

One of the most hopeful aspects for the expansion of the pulp and paper industry in east Texas and other Southern States lies in the opportunity it offers for the utilization of low-quality forest material not needed by other forest industries. East Texas has outstanding opportunities to produce pulpwood, along with continuous supplies of sawlogs and other forest products. The vast resources of hardwoods in the bottom lands of east Texas and in the Post Oak and Cross Timbers belts offer excellent possibilities for a pulp and paper industry which can utilize those species. Tests at the U. S. Forest Products Laboratory at Madison, Wis., have indicated the feasibility of using a semichemical process to convert swamp blackgum, sweetgum, oak, and other hardwoods into quality pulps, to be used alone or in mixtures, for newsprint, corrugating board, and a variety of specialty products. One southern mill now makes high-grade sulphite pulp from southern pine. Most southern pulp mills, however, use the sulphate or Kraft process.

An outstanding advantage to the east Texas pulp and paper industry is its nearness to supplies of chemicals used in the manufacturing process. Salt cake or sodium sulphate is the chief chemical raw material used in the sulphate process of digesting wood. From 150 to 450 pounds of salt cake or its equivalent per ton of finished pulp is utilized to maintain the concentration of the cooking liquor, the amount depending on the efficiencies of the washing and recovery processes. The principal supply of salt cake was formerly imported from Germany and other foreign sources but is now produced locally, from salt

and sulphur, another byproduct of this process being muriatic (hydrochloric) acid. Chlorine is the chief bleaching agent for all kinds of pulp, being utilized as such or in combination with lime as a hypochlorite. Oyster shells are occasionally used as a source of lime in the sulphate recovery process; limestone is employed ordinarily. Chemicals used in the manufacture of paper include rosin and alum (aluminum sulphate) for size, sodium silicate, glue, starch, and casein. Many of these raw materials are available in Texas or nearby States, or can be produced locally.

Rayon and Related Products

Synthetic fibers, designated in general as rayon, consist of cellulose chemically modified and spun into silklike filaments, strands, and yarns. Their production has increased markedly during the last few years, and they are particularly important now that imports of raw silk have ceased. Rayon can be produced by several different chemical processes. The raw materials commonly used have been wood pulp and cotton linters (the short lint recovered from the coatings on the cotton seed after the staple has been removed). Wood pulp makes up about 75 percent of the present production of rayon, which requires a highly purified cellulose. This is principally high-grade bleached sulphite pulp made from spruce and hemlock, but other conifers and also hardwoods have been reported as satisfactory. Seventy percent of the country's rayon production comes from the South. By modifying the processes, it is possible to produce cellophane or similar transparent sheeting used for wrapping and packaging.

Cellulose acetate, with a low inflammability, is finding wide use for moving-picture film, and by reason of its plastic properties, can be used to manufacture a great array of molded articles.

A mixture of nitric and sulphuric acids when made to react with cellulose produces nitrocellulose. When this reaction is carried to a high degree of nitration, it forms the high-explosive smokeless powder. When it is nitrated to a lesser degree this type of product may be cast into films such as photographic and motion picture and transparent sheeting in general. When combined with plasticizing agents such as camphor it may be molded into a wide variety of forms. When dissolved in solvents and produced in the form of low-viscosity cellulose nitrate it forms the most important constituent of the modern type of quick-drying lacquers for the coating of automobiles, furniture, and other surfaces requiring a hard, resistant, and durable protective coating.

Purified wood cellulose is being used increasingly for smokeless powder, plastics, lacquers, cellophane, and the like, and promises to play an even more important role in the future.

Mention should be made of lignin, one of the major components of wood and a byproduct of the pulp industry. Lignin compounds form a large proportion of pulpmill waste and contribute to stream pollution. Lignin is a potential source of plastics, not only by itself but also in combination with other materials. As such it offers possibilities for important new industrial developments.

Hardwood Distillation Products

The distillation of wood is an ancient industry, one of the chief products being charcoal. This is the carbonaceous residue left when wood is burned without enough air to insure its reduction to ashes. Chemists have isolated more than 60 individual chemical compounds from the vapors evolved in the distillation of hardwoods, but not all of these are worth purifying or are present in sufficient amount to be valuable. The principal products besides charcoal are methanol (wood alcohol), acetate of lime or acetic acid, and related chemicals. In recent years, synthetic methanol and synthetic acetic acid have seriously narrowed the market for both of these products from wood.

This is one of the few forest industries not concerned with large size or superior quality of the wood it consumes. Only 2 destructive hardwood plants are operating in the South at present, 1 in Arkansas and 1 in Tennessee.

Comparison of Growth and Drain

From a previous table (page 4) it will be noted that lumber makes up more than half the material removed annually from east Texas forests. The relation of growth to drain in east Texas forests during several recent years was as follows:

	1935	1936	1937	1938
Commodity drain, in M cords	3,574	4,200	4,541	4,168
Net increment in growing stock, in M cords ...	5,985	6,215	6,357	6,527
Relation of drain to growth, in percent	60	68	71	64
Commodity drain, in millions of board feet ...	1,362	1,582	1,646	1,474
Net increment in growing stock, in millions of board feet	1,822	1,848	1,881	1,917
Relation of drain to growth, in percent	75	86	88	77

Total growth expressed in cords or board feet exceeded total drain during the 1935-38 period. Most of the sawlog cutting, however, was concentrated on large, high-quality trees, with a resulting decrease in quality and value of the remaining growing stock. The war has increased the demands for all forest commodities, and east Texas' forests now are supplying increased quantities of lumber, boxboards, paper, and other essential war materials, with the result that the current drain on its timber supplies is undoubtedly greater than the amount being replaced through growth. This is an entirely justifiable measure in the present crisis and it is fortunate that these timber supplies are available for the emergency. Nevertheless, it is important that this great natural asset, so essential to our permanent national defense and economic security, be protected adequately and utilized wisely, with the least possible waste. President Roosevelt, in his message to Congress on January 7, 1942, recognized such need when he said: "It is necessary in wartime to conserve natural resources and keep in repair our national plant. We cannot afford waste or destruction, for we must continue to think of the good of future generations of Americans." The contribution of east Texas forests in the period of readjustment that will follow the war will be highly important, not only in providing the raw materials needed for a huge reconstruction program at home and abroad, but also in supplying outlets for labor and industry within the State.

Future Markets

East Texas forest resources are sufficiently ample, if managed properly, to furnish adequate quantities of forest products for the State's needs and leave a substantial balance for shipment outside the State. The proximity of the lumber markets of the Middle West and the excellent facilities for shipment to the Atlantic seaboard, to Latin America and other world markets, provide east Texas with many favorable outlets for its forest products.

Planning for the Future

Everyone will agree as to the necessity of producing all the forest raw materials needed for the war effort, even though this results in a temporary overcutting. However, this should be done with a minimum of waste and under methods which will properly use and conserve forest-productive capacity rather than tear it down. If east Texas forests are to yield maximum, sustained returns to the landowners and serve the best interests of the public, a number of actions should be taken now, the owners and public each contributing a share. This is the time to lay sound plans for a forestry program to meet the problems and adjustments of the post-war period. Later on will be too late.

Of major importance is to see that all east Texas forest lands receive adequate protection from fire, insects, and disease. This is particularly urgent as a war measure, to avoid critical losses during this emergency. It will mean that additional public and private funds must be made available for such protection purposes.

To obtain a crop of timber by good forest protection and management is of no permanent value if the productivity of the forest is subsequently curtailed or impaired by improper or destructive cutting. Therefore it seems essential, in the public interest, that timber harvesting practices on private lands be placed under some form of public control. This could be done by adopting cutting standards that will prevent unnecessary destruction and deterioration of the forest resource, thus assuring that forest lands will be kept reasonably productive and that watershed protection values will not be impaired. Such requirements are relatively simple; in fact, many private owners who are now practicing good forestry are doubtless already conforming to such proposed cutting standards. What happens to Texas forests is a matter of concern to all of the country, which uses considerable lumber and other forest materials produced in Texas. Therefore it is a primary responsibility of the Federal Government to see that necessary actions are taken to protect this vital natural resource.

Other measures needed to improve the present forestry situation in east Texas include:

1. Acquisition and management by communities, counties, the State, or the Federal Government of forest lands of vital public interest, such as important watersheds or devastated areas and those submarginal for private forest management. On Federally acquired lands a proportion of the current income is returned to the local governments in lieu of taxes. The great bulk of the forestry job, however, still will remain with the private owners.

2. Much more needs to be done in the way of forest extension, education, demonstration, and technical guidance to obtain proper forest management and marketing of timber products.

3. Much additional information is needed to provide the scientific basis for good forestry practice and this can best be obtained through forest research; due to insufficient funds, present forest research efforts are short of actual needs.

4. Obstacles to stabilized ownership necessary for long-time forest management should be removed or ameliorated—among these are discriminatory taxes, unfair freight rates, and unfavorable credit and insurance facilities.

Conclusion

East Texas forests, which occupy almost 6 out of every 10 acres of its land area, are of inestimable value in the nation's war effort. They also can and should play a major role in the post-war future of this great commonwealth. Forests differ from most other natural resources in that they can be fully used, and, at the same time, be made to increase in volume and value. Forestry progress in east Texas is being implemented by the work of the Texas Forest Service, the State extension forester, and by the research and administrative groups of the U. S. Forest Service. All of these agencies are working towards obtaining good forestry practices in east Texas forests.

A fully developed forestry program for this region will bring increased forest-products industries, more jobs for labor, additional revenues, and improved social conditions. The public agencies and the landowners share the responsibility of taking whatever actions may be necessary to assure that this great natural resource is utilized wisely and contributes fully to the greatest good of all the people.